PHOSDRIN RESIDUE ON FOLIAGE OF STRAWBERRY PLANTS IN MONTEREY COUNTY, CALIFORNIA MAY 1975

By

Keith T. Maddy, Staff Toxicologist
Charles S. Kahn, Agricultural Inspector
Gary Sprock, Agricultural Inspector
A. Scott Frederickson, Agricultural Chemist

ACF 59-317

California Department of Food and Agriculture
Division of Pest Management, Environmental
Protection and Worker Safety
Worker Health and Safety Branch
1220 N Street, Sacramento, California 95814

PHOSDRIN RESIDUE ON FOLIAGE OF STRAWBERRY PLANTS IN MONTEREY COUNTY, CALIFORNIA MAY 1975

By

Keith T. Maddy, Staff Toxicologist; Charles S. Kahn, Agricultural Inspector; Gary Sprock, Agricultural Inspector; A. Scott Frederickson, Agricultural Chemist

Agricultural Chemicals and Feed
Depratment of Food and Agriculture
1220 N Street, Sacramento, California 95814

Phosdrin (mevinphos) is a highly toxic organophosphate registered for use on a broad range of field, forage, vegetable and fruit crops to control aphids, mites, leafhoppers and many other insects. The acute oral LD_{50} (rats) is approximately 3.7 mg/kg, while the acute dermal LD_{50} (rabbit) is approximately 16.0-33.8 mg/kg. Phosdrin consists of two isomers; the highly toxic alpha isomer and the less toxic beta isomer. The alpha isomer consitutes approximately 60 percent of the active ingredient. The label for Phosdrin 4E states that Phosdrin be applied to strawberries at no more than one quart in 5 to 20 gallons of water per acre when applied by air. The preharvest interval is one day for most applications; but for the higher application (1 quart) rates some labels recommend a two-day preharvest interval. The tolerance level for Phosdrin on strawberries has been set at one ppm. California has not set a worker safety reentry interval, but general label specifications range from no statement about worker reentry to a 24-hour reentry period.

As part of a study of potential field worker safety hazards, an analysis was made of the rate of decay on leaves of Phosdrin applied as a foliar spray on two fields of strawberries in Monterey County in 1975.

APPLICATION

Field No. 1: (18 acres)

1 pint (1/2 pound actual) Phosdrin in 20 gallons of water per acre
Applied: Aerially, completed at 8:00 a.m., April 30
Sampled: April 30 at 1:30 p.m.
May 1 at 3:00 p.m.

Field No. 2: (24 acres)

1 quart (1 pound actual) Phosdrin in 20 gallons of water per acre
Applied: Aerially, completed at 6:30 a.m., May 1
Sampled: May 1 at 2:00 p.m.
May 2 at 9:00 a.m.

FIELD SAMPLING

Triplicate samples were taken at 6-1/2 and 32 hours in field No. 1 and 7-1/2 and 27 hours in field No. 2 following the Phosdrin application. The samples each contained 100 leaf discs, 2.5 cm. in diameter. Duplicate samples were taken for surface and penetrated analysis and the third for total residue analysis. The two values obtained for surface and penetrated residue were averaged when the graphs were plotted.

ANALYTICAL PROCEDURES

The procedure used for the extraction of dislodgeable, penetrated, and total residues from leaf punches was originally published by Gunther in "The Bulletin of Environmental Contamination and Toxicology", 9, 243-249, 1973. It has been documented several times in detail, with modifications that were made by our laboratory to accommodate the various pesticides and their metabolites.

Extraction

The sample container and leaf punches are weighed and the gross weight recorded.

Total Residues

1. The leaf punches are transferred to a blending jar. The empty sample container is again weighed and the net weight of the punches recorded.

2. Approximately 50 gms of sodium sulfate and 100 mls of ethyl acetate are added.

3. The sample is blended at high speed for 3 minutes, keeping the blender cup cool by immersing it in a container of cool water. The blender cup is removed and the sample allowed to settle.

4. An aliquot is decanted into a teflon-capped bottle and stored in the freezer prior to clean up and analysis.

Dislodgeable Residues

1. Fifty mls of water and approximately 4 drops of Sur-Ten solution (1:50) is added to the sample containers. The containers are capped and placed in a multipurpose rotator and rotated at 30 cycles/min. for 60 mins. The aqueous solution is decanted through a glass wool plug into a 500 ml separatory funnel.

2. The punches are rotated a second time, using 50 mls of water and 4 drops of Sur-Ten solution, for 30 min. This is added to the first extraction.

3. The sample is then hand shaken for approximately 10 secs with 30 mls of water. The container is drained into the separatory funnel with the first two extractions.

4. The aqueous solution is extracted three times with 50 ml of $CHCl_3$. The solvent is filtered through sodium sulfate into a glass stoppered mixing cylinder and the volume is recorded. The solvent is mixed in the cylinder. An aliquot is decanted into a teflon capped bottle and stored in the freezer prior to clean up and analysis.

Penetrated Residue

1. After the last water rinse is drained for the dislodgeable residue, the punches are transferred to a blender jar. The empty sample container is weighed and the net weight of the punches recorded.

2. Approximately 50 gms of sodium sulfate and 100 mls of ethyl acetate are added.

3. The sample is blended and handled the same as the total residue sample.

Gas Chromatograhpy

The samples were analyzed with a Varian Series 2700 gas chromatograph equipped with a flame photometric detector in its specific mode and under the following conditions:

Column - 6 ft. X 2 mm I.D., 3% OV, 275 on 100/200 mesh, Chrom W(HP) at 175°C
Injector Temperature - 230°C
Detector Temperature - 230°C
Retention Times: Alpha Phosdrin - 2.0 min
Beta Phosdrin - 2.8 min

RESULTS

Weather observations for the study period are given in Table 1. The average minimum and maximum temperatures are 46.5 and 62.5°F, respectively.

The results of the residue analysis are summarized in Table " and Graphs 1 and 2. Phosdrin shows incomplete degradation during the test period.

TABLE 1: DAILY TEMPERATURE AND PRECIPITATION

Observations taken at Salinas weather station, Monterey County, California

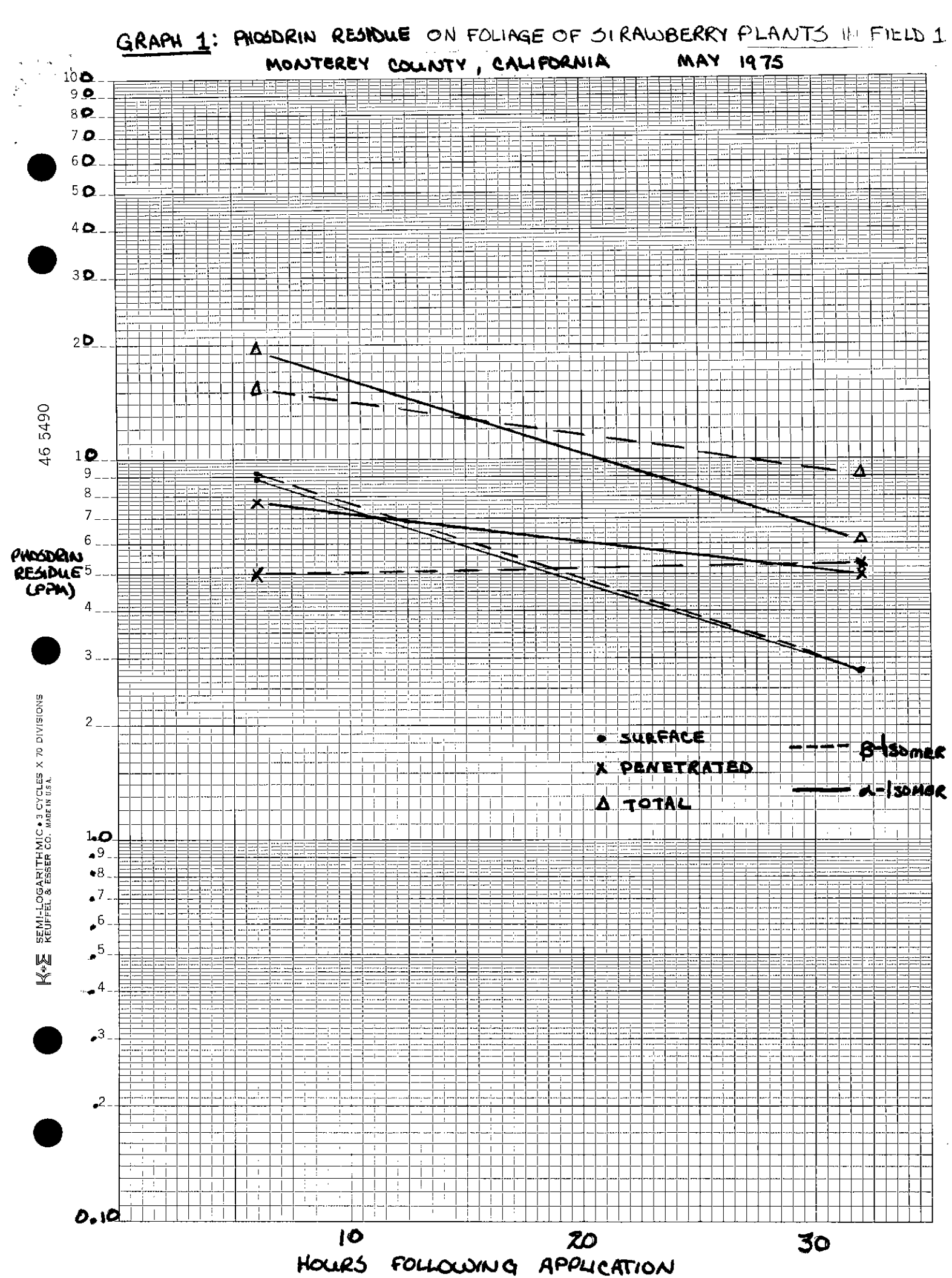
DATE (1975)	TEMPERATURE Maximum	Minimum	PRECIPITATION (Inches)
4-29	62	43	
4-30	61	48	
5-1	58	47	
5-2	62	48	
Average	62.5	46.5	Total 0.0

TABLE 2: RESIDUES ON FOLIAGE OF STRAWBERRY PLANTS FOLLOWING PHOSDRIN APPLICATION TO TWO FIELDS IN MONTEREY COUNTY

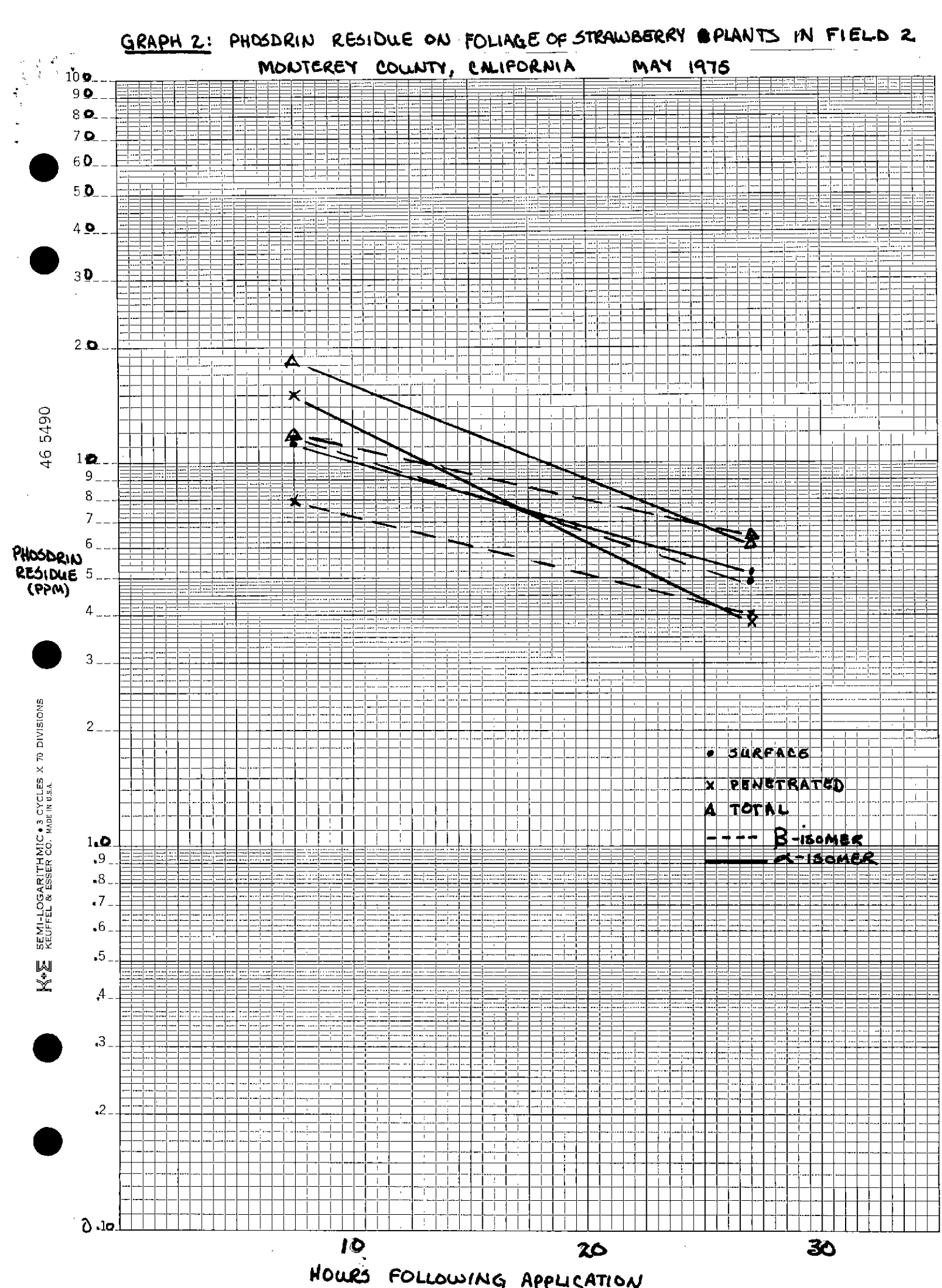
Sample	Hours Post-Application	Surface Residue Alpha	Beta	Penetrated Residue Alpha	Beta	Total Residue Alpha	Beta
Field 1							
1	6.5	11.2	11.0	7.3	4.8		
2	6.5	6.7	7.2	8.2	5.2		
3	6.5					19.6	15.6
4	32	2.5	2.6	4.9	5.8		
5	32	3.1	3.0	2.1	2.6		
6	32					6.2	6.2
Field 2							
1	7.5	11.1	10.8	11.0	5.7		
2	7.5	11.1	12.1	19.1	10.2		
3	7.5					18.5	11.7
4	27	4.6	4.1	5.0	5.6		
5	27	5.8	5.8	2.5	2.5		
6	27					6.2	6.4

GRAPH 1: PHOSDRIN RESIDUE ON FOLIAGE OF STRAWBERRY PLANTS IN FIELD 1

MONTEREY COUNTY, CALIFORNIA MAY 1975



GRAPH 2: PHOSDRIN RESIDUE ON FOLIAGE OF STRAWBERRY PLANTS IN FIELD 2
MONTEREY COUNTY, CALIFORNIA MAY 1975

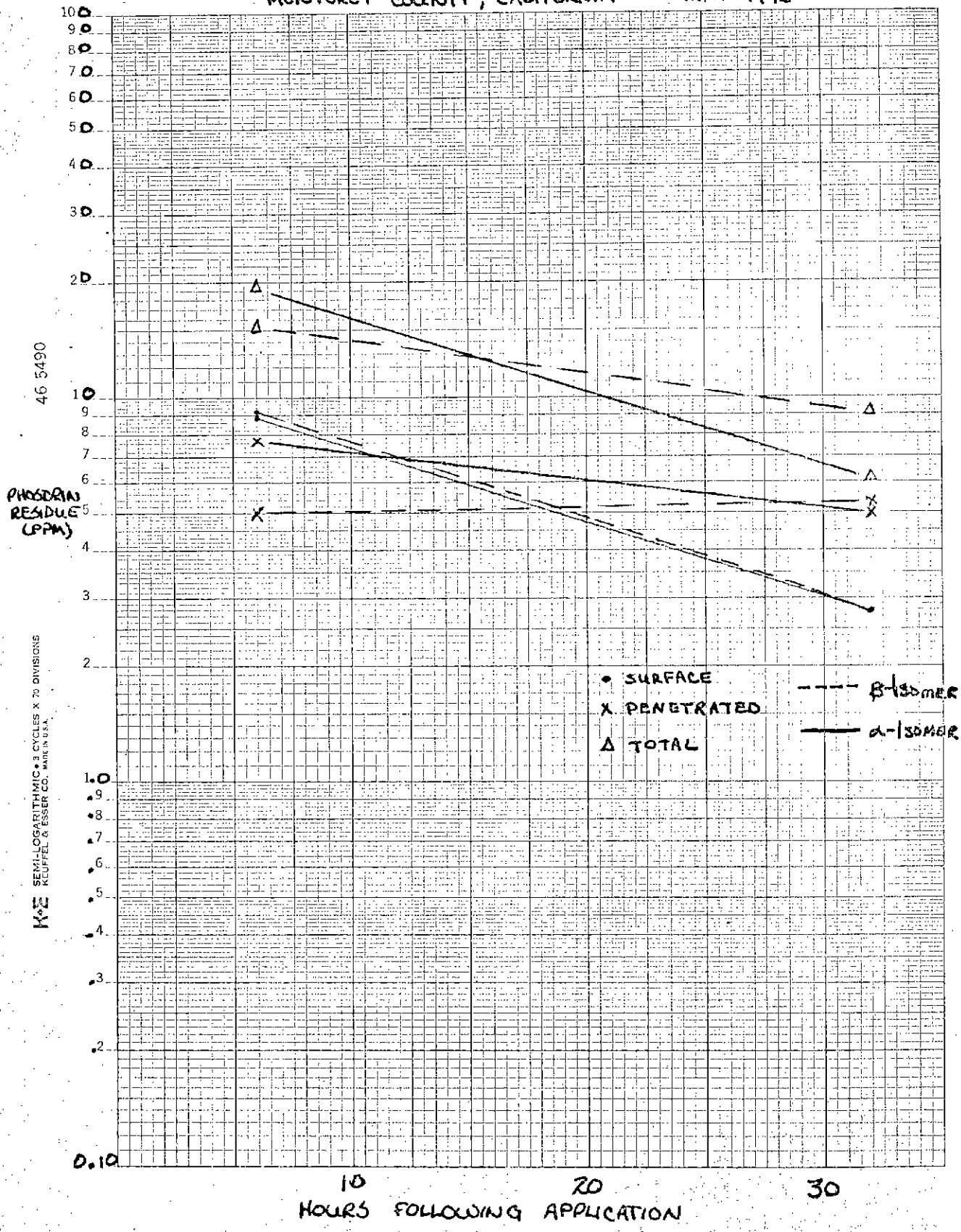


46 5490

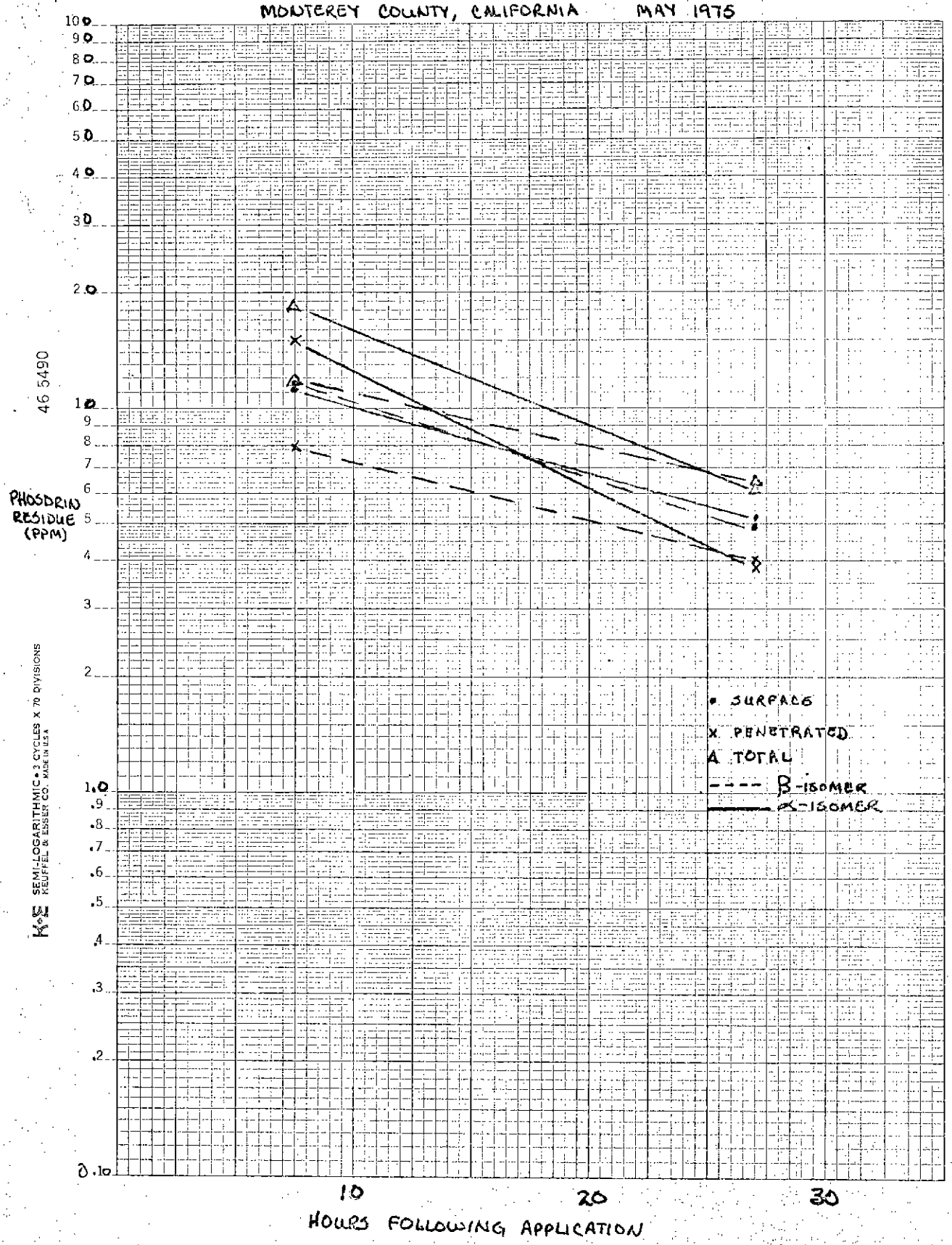
KE SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

GRAPH 1: PHOSDRIN RESIDUE ON FOLIAGE OF STRAWBERRY PLANTS IN FIELD 1

MONTEREY COUNTY, CALIFORNIA MAY 1975



GRAPH 2: PHOSDRIN RESIDUE ON FOLIAGE OF STRAWBERRY PLANTS IN FIELD 2
MONTEREY COUNTY, CALIFORNIA MAY 1975



EC. 2 A & B Precision GRAPH 1